Point-of-care assessment of platelet aggregation in infants and children with cyanotic and acyanotic heart disease undergoing open-heart surgery.

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Background and goal of the study

Conflicting results exist regarding platelet (PL) count/function in infants with Cyanotic (Cyan) compared to Acyanotic (Acyan) heart disease¹⁻². We investigated this point and analysed the transfusion rate of PL concentrates in a homogeneous group of infants with these pathologies.

Material and methods

This is a subanalysis of a prospective double-blinded randomised trial (NCT02567786) evaluating the effectiveness of a pump prime based on FFP vs Plasmalyte® in infants weighing 7-15 kg and undergoing open-heart surgery. Blood was drawn for PL count and PL function evaluated by Point Of Care (POC) tests Multiplate® (ADP, ASPI, TRAP) and ROTEM® after the induction of anaesthesia (T1), at the end of cardiopulmonary bypass (T2) and at Paediatric Intensive Care Unit (PICU) arrival (T3). Transfusion was based on clinical bleeding and guided with POC tests. A repeated measure ANOVA was performed to analyse the effect of time and group on PL count and function. A Student's t-test and Fisher's exact were used to respectively compare continuous and categorical variables between both groups.

Results and discussion

After parental informed consent 30 children were included of whom 29 analysed (Table 1). As shown in Table 2 there was no significant difference between groups regarding POC tests and PL count. There was a statistically significant difference within groups for PL count, MCF EXTEM and ADP: $p < 0.001$ T1 vs T2 and vs T3. This effect was much less observed for ASPI/TRAP. The transfusion of PL concentrates was similar between both groups.

Table 1: Baseline and perioperative data of patients

	Cyan (N=14)	Acyan (N=15)	p
Age (months)	23 ± 16	25 ± 16	0.65
Weight (kg)	10.4 ± 2.5	10.6 ± 2.7	0.83
Baseline fibrinogen (mg/dL)	300 ± 86	340 ± 73	0.20
Baseline Hb (mg/dL)	15.5 ± 1.75	11.5 ± 1.67	< 0.001
Baseline PL count (*10 ³ /mm ³)	336 ± 103	391 ± 134	0.23
Baseline Activated partial thromboplastin time	32 ± 4	31 ± 4	0.40
Baseline International Normalized Ratio	1.1 ± 0.1	1.1 ± 0.1	0.33
Baseline Prothrombin Time	12.7 ± 0.9	12.3 ± 1.2	0.40
CPB time (min)	169 ± 67	131 ± 51	0.11
N patients transfused PL (OR)	4 (29%)	1 (7%)	0.17
Transfusion PL (OR)* (mL/kg)	0 (0 - 8)	0 (0 - 0)	0.13
N patients transfused PL (PICU)	2 (14%)	1 (7%)	0.60
Transfusion PL (PICU)* (mL/kg)	0 (0 - 0)	0 (0 - 0)	0.56
Blood loss 6h post-op* (mL/kg)	7.3 (6.0 - 10.0)	5.4 (2.7 - 8.0)	0.03

Table 2: PL count and POC tests

	T1	T2	T3
PL count P = 0.07 { Cyan Acyan	336 ± 103* 391 ± 134*	151 ± 49 179 ± 98	176 ± 70 205 ± 81
ADP AUC P = 0.22 { Cyan Acyan	747 ± 217* 894 ± 269*	288 ± 202 477 ± 342	378 ± 206 430 ± 249
ASPI AUC P = 0.27 { Cyan Acyan	1000 ± 293** 1129 ± 363**	715 ± 489 976 ± 727	732 ± 372 775 ± 498
TRAP AUC P = 0.43 { Cyan Acyan	967 ± 258** 1165 ± 303**	824 ± 438 914 ± 727	693 ± 305 656 ± 372
MCF EXTEM P = 0.16 { Cyan Acyan	61 ± 5* 64 ± 7*	48 ± 8 52 ± 10	50 ± 8 53 ± 7

*P<0,001: T1 vs T2 and T1 vs T3

**P<0,01: T1 vs T3

ADP: Adenosine Diphosphate

ASPI: Aspirine

TRAP: Thrombin Receptor Activating Peptide

AUC: Area Under the Curve

MCF: Maximum Clot Firmness

Data are expressed as N (%), mean ± SD or median (P25 – P75)*

Conclusions

- The results of this study show that PL number as well as PL function analysed by ROTEM® significantly deteriorate after CPB in infants with Cyan as well as Acyan heart disease without significant difference between groups.
- PL function test Multiplate® did not give additional information already available with PL count and ROTEM®.
- The transfusion of PL concentrate was not significantly different between both groups although children with Cyan heart disease showed statistically significant more blood loss up to 6 h postoperatively.

References

1. Ranucci M. Minerva Anesthesiol 2012;
2. Hofer A. BJA 2011.